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TREDGOLD'S "CARPENTRY"

Elementary Principles of Carpentry. By Thomas Tredgold, C.E. Sixth Edition, by E. Wyndham Tarn, M.A., Architect. (London: Crosby Lockwood and Co., 1885.)

MR. TARN has for a good many years enjoyed a high reputation amongst the profession of architects as a writer upon the practical principles of building regarded mathematically. Tredgold's treatise on Carpentry has for a very long time indeed possessed the highest reputation as a much more than elementary book of reference upon that important department of building construction which deals with timber work; it has been republished time after time in the form of the old-fashioned substantial quarto which used to be in vogue before we were encouraged to expect to read as we run. It is quite in accordance with the fitness of things that Tredgold and Mr. Tarn should come together, and the English building world will scarcely require to be told that the result is satisfactory. The new edition before us is in fact a readaptation once more of the excellent material of the old standard treatise to the changing condition of our mechanical knowledge and skill. The author's mode of treating his subject has been retained intact; and we still have the well-known sections upon pressures, resistances, floors, roofs, domes, partitions, centers, bridges, joints, and timber. Whether this particular arrangement is the best, is a question scarcely worth asking, at least on behalf of the less fastidious criticism of those practical designers of carpentry who must here constitute the overwhelming majority of readers; but the editor has certainly not found it to be any bar to the importation of new matter in his own way. In one section he has introduced Prof. Clerk Maxwell's now universally appreciated system of diagrams of pressures, whereby the mere application of a common drawing scale to the component lines of easily constructed geometrical figures saves all further trouble and uncertainty in ascertaining the precise strains which the several members of a truss have to bear. In other sections the accepted formulæ of calculation, given only empirically by Tredgold, are mathematically demonstrated. The familiar tables of strength which supply the values of constants are "corrected" to accord with recent experiments more delicately and adroitly conducted, and several new tables of the kind are added. The consequent revision of Tredgold's "rules" and tables of scantlings has been thoroughly and carefully done; and various modes of more advanced construction are duly developed. That difficult subject, the theoretical thrust of domes—for in practice there ought to be none—is taken in hand mathematically, and a short chapter is added on stone vaulting. The important items of scaffolding, shoring, coffer dams, and so on, have been also introduced. The remarkable timber bridges of America—rough and ready science of the best—have been taken account of as they ought; and certain amendments which are made in respect of the plates serve in a reasonable measure to substitute new trussing for old. Lastly, the description of the nature and properties of timber is largely modified to meet the advanced knowledge of the day. With all this, the Tredgoldian character of the treatise is dutifully preserved; and so we may say it ought to be, for to modernise Tredgold too much would certainly not improve him. One of the prominent merits of the work consists in the unusually large number of illustrative plates, all to a useful scale. If these do not represent many of the more modern designs in timber work, they frequently offer examples to the student which are all the better in one respect—they exemplify that substantiality of construction which it is too much the tendency of scientific precision almost to discourage. It is a good maxim in carpentry as in most other departments of building, to make the structure not only strong but stronger than strong; and Tredgold always leans in that direction. The word *economy* is much employed amongst us; but, whereas its original and proper signification pointed only to skilful administration, its meaning with us is very much like mere parsimony. Waste of material is the bugbear of our builders, and almost still more of our architects. It need not be denied that mathematical science is in a certain way provocative of such parsimony; indeed, lightness of construction is regarded as an academical virtue in both architecture and engineering. But a moment's reflection ought to satisfy alike the most scientific and the least that true science is as much averse to parsimony of substance as common sense is. The strength of building materials can only be determined by extremely delicate experiments upon "breaking" strains, from the results of which the "safe" strains have to be deduced by estimate; and this, no doubt, becomes matter of opinion. The question is, what proportion of the breaking strain shall be recognised—almost arbitrarily—as the safe strain? With the single exception of iron, timber is the material with reference to which this matter of opinion is the most definitively settled. The reason is this:—The breaking strain must be instantaneously applied; this is essential to precision of tabulation. The safe strain is that proportion of this instantaneous breaking strain which the material will bear permanently without any risk of its elasticity being eventually overcome and a commencement made of that disturbance of the structure of the material which, once begun, increases in a geometrical ratio until the end is ruin. It is accepted, therefore, that the proportion of an ascertained instantaneous breaking strain which has to be recognised as the limit of a permanent safe strain is one-third, one-fourth, and so on, according to the character of the material. What does this mean? It means that a greater strain than this proportion would in time, with one accidental circumstance and another, produce a commencement of instability. Perhaps it is to be regretted that this question is still disposed of so empirically as it is; we might at least in these days have express observations made and reduced to what system might appear. Tredgold's rules turn very much upon the manifestations of flexure; and this, of course, is not only another way of dealing with the matter, but one which affords at any rate a basis upon which mathematical formulæ may be arrived at. On the whole, Tredgold is an old-fashioned writer, empirical and practical; but he is none the worse for that, perhaps all the better. Mr. Tarn has accepted the duties and responsi-

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bilities of a scientific ally, and we have pleasure in testifying that he does his work well, and that he does not overdo it.

THE MYRIOPODS OF AUSTRIA

Die Myriopoden der Oesterreichisch-Ungarnischen Monarchie. 2$^{\text{te}}$ Hälfte, "Die Symphylen, Pauropoden, und Diplopoden." Von Dr. R. Latzel. (Vienna: Hölder, 1884.)

WHEN we say that the second volume of Dr. Latzel's work is in every way equal to the first we are according to it high praise. The first volume, that which dealt with the Chilopoda, has fully proved itself to be indispensable to every student of the Myriopoda, and it seems to us certain that this second volume, dealing with the other orders, must soon be accorded an even more important place in the literature of this subject. Nine years of close attention to the study of the myriopods have enabled Dr. Latzel not merely to complete a monograph of the species inhabiting his native country, but to complete it in such a manner that he has written a book which must be useful to the student of the myriopoda of any country. Not only has Dr. Latzel given minute descriptions of some 170 species, but he has also furnished tables which make it a matter of ease to determine the genus of any myriopod.

There has been unfortunately among those who have specially devoted attention to myriopods a tendency to create numerous new species on very insufficient grounds. By relying solely on characters of importance, Dr. Latzel has in great measure escaped this tendency. It is true that in the volume now under notice he has described a new genus and thirty-five new species. Possibly further observation may reduce this number; but when we remember the extent of area embraced by the Austro-Hungarian Empire, and the little attention which, comparatively speaking, has been paid by naturalists to myriopods anywhere, we must admit that thirty-five is no excessive number of new species; indeed, those who are familiar with the writings of others who have described myriopods must feel thankful that it is so small. A careful synonymy has been given of each species described; this is one of the most useful features of the book, as in this part of his work Dr. Latzel seems to us to have been singularly successful. It can have been no easy task to reduce to order the bulky mass of existing nomenclature; but Dr. Latzel has spared no pains in examining and comparing the types, generally insufficiently described, of his predecessors. It is much to be wished that some capable observer would take in hand to examine the types of the earlier English describers of myriopods, especially with regard to the Chilopoda described by Newport, and compare them with the types of Continental writers, for, so we fancy, the synonymy would be yet further reduced to order. Here we may refer to the only point in nomenclature which we regret in Dr. Latzel's book. He has adopted the specific name *venustus*, Meinert 1868, for an animal which Dr. Latzel evidently suspects to be, and which we have no doubt is, the same as that described by Leach in 1814 as *Julus pulchellus*.

One admirable feature of this work is that, where possible, full descriptions are given of the young stages of each species. As to the details of the work there is not much room for criticism. Dr. Latzel has embodied in his work the results of all recent researches into the minute anatomy of the myriopods. Embryology, indeed, has not received a very large share of attention, but references are given to all writings on the subject. Dr. Latzel differs from some American authorities in looking on Scolopendrella as a true myriopod, and places its order Symphyla as intermediate between the Chilopoda and the Pauropoda. We may here note that Dr. Latzel agrees with Menge in considering those organs which Ryder has described as tracheæ in Scolopendrella, as being merely chitinous supports for muscle-attachment. These are the same organs which Wood-Mason (*Ann. Nat. Hist.* [5] xii. 53) considers are of the nature of segmental organs.

A short notice of fossil myriopods is given, based chiefly on Scudder's researches into the fossil species of America. Scudder's conclusion seems to us to be in many points erroneous, and at any rate to be premature and based on insufficient knowledge, but as no fossil myriopods have yet been found in Austro-Hungary we can only be thankful to Dr. Latzel for dealing with fossil forms at all. The same must be said with regard to the notice of the order Malacopoda. No species of Peripatus has yet been discovered in Europe, but, though we may not agree with him, it is interesting to know that one so qualified to judge as Dr. Latzel, looks on Peripatus as forming an order equivalent to the other orders, the Chilopoda, the Symphyla, and the Diplopoda. A most useful bibliography, brought down to the date of publication, is comprised in the work. The execution of the sixteen plates, showing morphological details, is excellent in every way.

OUR BOOK SHELF

Examples in Heat and Electricity. By H. H. Turner. (London: Macmillan and Co.)

THIS is a Cambridge collection of problems and riders extracted mainly from the Smith's Prize, Tripos, and College papers of the last dozen years. The compiling (for there is nothing to be called authorship) has been, on the whole, judiciously done; and the printing is unusually clear and accurate, considering the complexity of many of the formulæ. The book is designed primarily as a help to candidates for mathematical honours, and will undoubtedly prove useful to them; possibly, perhaps, to a few private students.

But to the natural philosopher the book presents some points of curious interest. For, in these seventy pages alone, may be found (by all who know the subjects) materials for a very complete examination of one important part of the Cambridge system, alike in its present condition and during its recent development. Here and there we detect at a glance the lion-claw of the true physicist, and can, unhesitatingly, write against a question the name of Stokes, Thomson, Clerk-Maxwell, &c., so strongly marked is the individuality of these men:—who *think* in physics, thus propounding nothing unphysical; and who use mathematics as a necessary instrument of expression, neither courting nor shunning mere technical difficulties. Each of their questions stands out like a green oasis in a sandy desert! The rest of the contents (except what is but thinly-veiled "book-work") is mainly the work of *Examining Mathematicians*—the men who use physical facts (or fancies) as mere pegs on which to hang complex catenaries of formulæ; to whom $pt = Rv$ would come quite as naturally and as usefully as the laws of Boyle and Charles; the men who can *explain the result* when

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